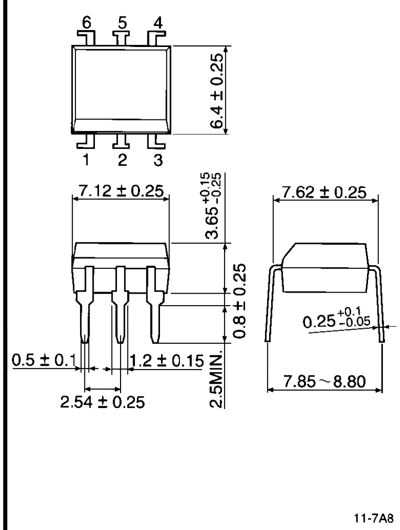
TOSHIBA PHOTOCOUPLER GaAs IRED & PHOTO-TRANSISTOR

4N38(Short), 4N38A(Short)

AC LINE / DIGITAL LOGIC ISOLATOR.
DIGITAL LOGIC / DIGITAL LOGIC ISOLATOR.
TELEPHONE LINE RECEIVER.
TWISTED PAIR LINE RECEIVER.
HIGH FREQUENCY POWER SUPPLY FEEDBACK CONTROL.
RELAY CONTACT MONITOR.

Unit in mm



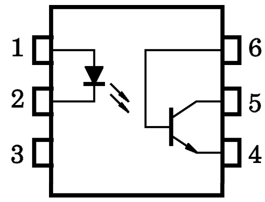
TOSHIBA 11-7A8

Weight : 0.4g

The TOSHIBA 4N38 (Short) through 4N38A (Short) consists of a gallium arsenide infrared emitting diode coupled with a silicon phototransistor in a dual in-line package.

- Switching Speeds : 3μs (Typ.)
- DC Current Transfer Ratio : 100% (Typ.)
- Isolation Resistance : $10^{11}\Omega$ (Min.)
- Isolation Voltage : 2500Vrms (Min.)
- UL Recognized : UL1577, File No. E67349

PIN CONFIGURATIONS (Top view)



1 : ANODE
2 : CATHODE
3 : N.C.
4 : EMITTER
5 : COLLECTOR
6 : BASE

980910EBC1

MAXIMUM RATINGS (Ta = 25°C)

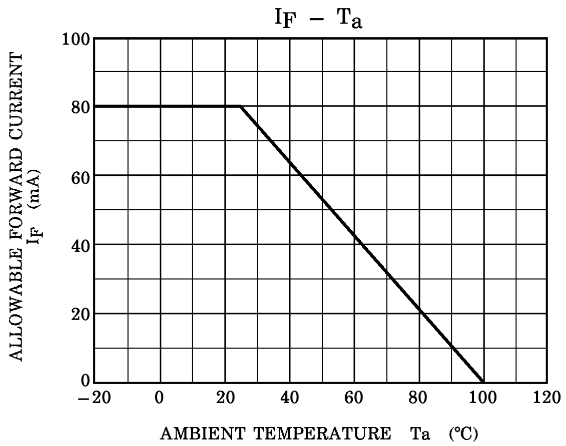
	CHARACTERISTIC	SYMBOL	RATING	UNIT
LED	Forward Current (Continuous)	I_F	80	mA
	Forward Current Derating	ΔI_F / °C	1.07 (*)	mA / °C
	Peak Forward Current (Note 1)	I_{PF}	3	A
	Power Dissipation	P_D	150	mW
	Power Dissipation Derating	ΔP_D / °C	2.0 (*)	mW / °C
	Reverse Voltage	V_R	3	V
DETECTOR	Collector-Emitter Voltage	BV_{CEO}	80	V
	Collector-Base Voltage	BV_{CBO}	80	V
	Emitter-Collector Voltage	BV_{ECO}	7	V
	Collector Current (Continuous)	I_C	100	mA
	Power Dissipation	P_C	150	mW
	Power Dissipation Derating	ΔP_C / °C	2.0 (*)	mW / °C
COUPLED	Storage Temperature	T_{stg}	−55~150	°C
	Operating Temperature	T_{opr}	−55~100	°C
	Lead Soldering Temperature (at 10s)	T_{sol}	260	°C
	Total Package Dissipation	P_T	250	mW
	Total Package Power Dissipation Derating	ΔP_T / °C	3.3 (*)	mW / °C

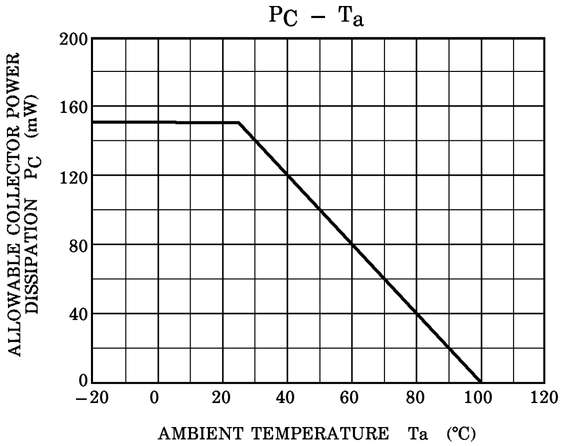
(Note 1) Pulse width 300μs, 2% duty cycle.
(*) Above 25°C ambient.

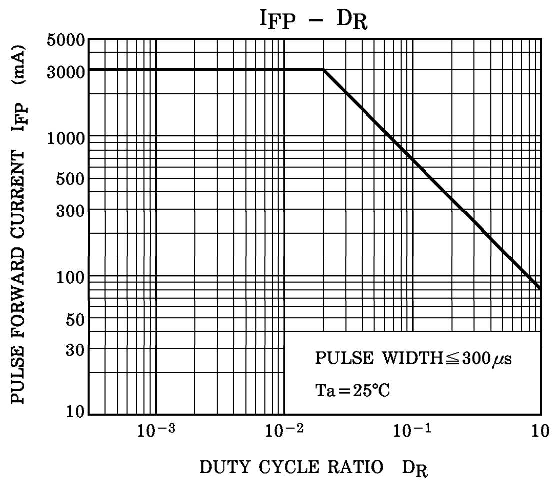
ELECTRICAL CHARACTERISTICS (Ta = 25°C)

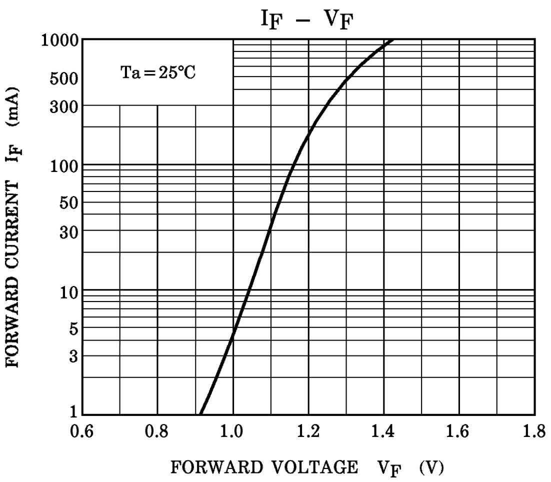
	CHARACTERISTIC		SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
LED	Forward Voltage		V_F	$I_F = 10mA$	—	1.15	1.5	V
LED	Reverse Current		I_R	$V_R = 3V$	—	—	100	μA
LED	Capacitance		C_D	V = 0, f = 1MHz	—	30	—	pF
DETECTOR	DC Forward Current Gain		h_{FE}	$V_{CE} = 5V$, $I_C = 500\mu A$	—	200	—	—
DETECTOR	Collector-Emitter Breakdown Voltage		$V_{(BR)CEO}$	$I_C = 1mA$	80	—	—	V
DETECTOR	Collector-Base Breakdown Voltage		$V_{(BR)CBO}$	$I_C = 100\mu A$	80	—	—	V
DETECTOR	Emitter-Collector Breakdown Voltage		$V_{(BR)ECO}$	$I_E = 100\mu A$	7	—	—	V
DETECTOR	Collector Dark Current		I_{CEO}	$V_{CE} = 60V$	—	1	50	nA
DETECTOR	Collector Dark Current		I_{CBO}	$V_{CB} = 60V$	—	0.1	20	nA
DETECTOR	Collector-Emitter Capacitance		C_{CE}	V = 0, f = 1MHz	—	10	—	pF
COUPLED	Current Transfer Ratio		I_C / I_F	$I_F = 10mA$, $V_{CE} = 10V$	10	100	—	%
COUPLED	Collector-Emitter Saturation Voltage		$V_{CE(sat)}$	$I_F = 20mA$, $I_C = 4mA$	—	—	1.0	V
COUPLED	Capacitance Input to Output		C_S	$V_S = 0$, f = 1MHz	—	0.8	—	pF
COUPLED	Isolation Resistance		R_S	$V_S = 500V$, R.H. ≦ 60%	10^{11}	—	—	Ω
COUPLED	Isolation Voltage		BV_S	AC, 1 minute	2500	—	—	Vrms
COUPLED	Isolation Voltage	4N38	BV_S (*)	AC, peak	1500	—	—	Vpk
COUPLED	Isolation Voltage	4N38A	BV_S (*)	AC, peak	2500	—	—	Vpk
COUPLED	Isolation Voltage	4N38A	BV_S (*)	AC, 1 second	1775	—	—	Vrms
COUPLED	Turn-On Time		t_{ON}	$V_{CE} = 10V$, $I_C = 2mA$, $R_L = 100\Omega$	—	3	—	μs
COUPLED	Turn-Off Time		t_{OFF}	$V_{CE} = 10V$, $I_C = 2mA$, $R_L = 100\Omega$	—	3	—	μs

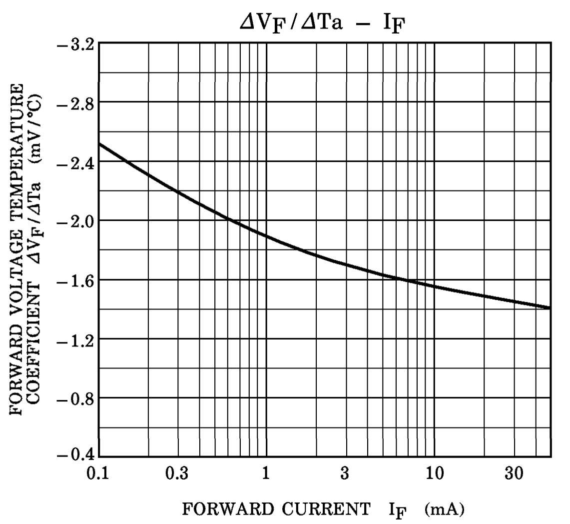
(*) JEDEC registered minimum BV_S, however, TOSHIBA specifies a minimum BV_S of 2500Vrms, 1 minute.

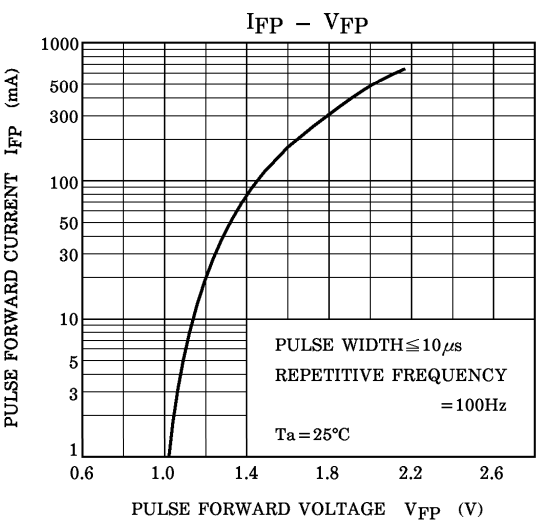

IF – Ta
ALLOWABLE FORWARD CURRENT IF (mA)
AMBIENT TEMPERATURE Ta (°C)

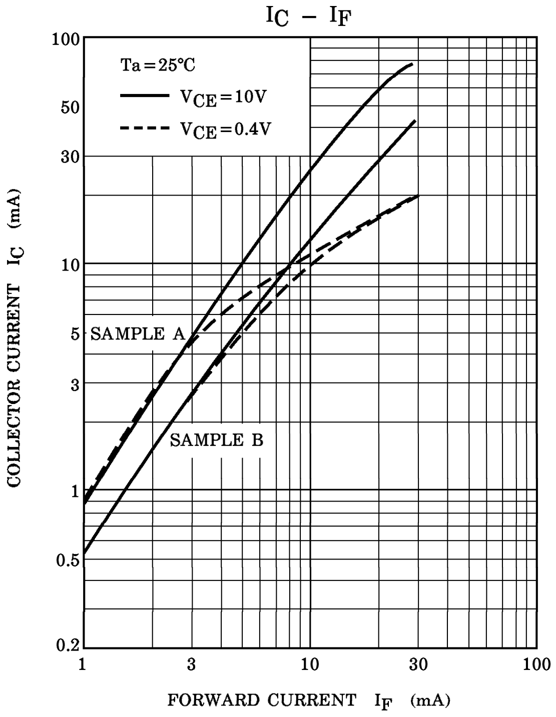

PC – Ta
ALLOWABLE COLLECTOR POWER DISSIPATION PC (mW)
AMBIENT TEMPERATURE Ta (°C)

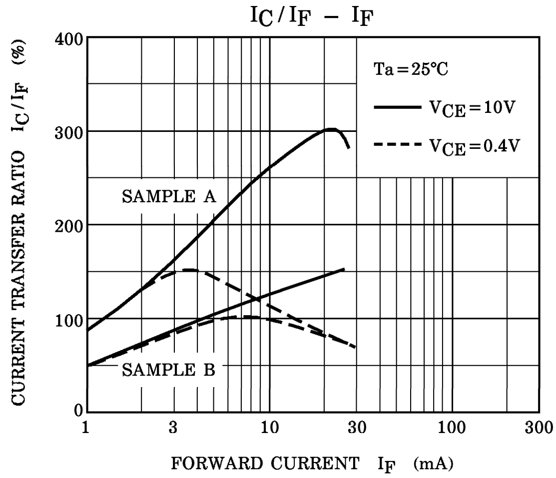

IFP – DR
PULSE FORWARD CURRENT IFP (mA)
PULSE WIDTH≦300μs
Ta=25°C
DUTY CYCLE RATIO DR

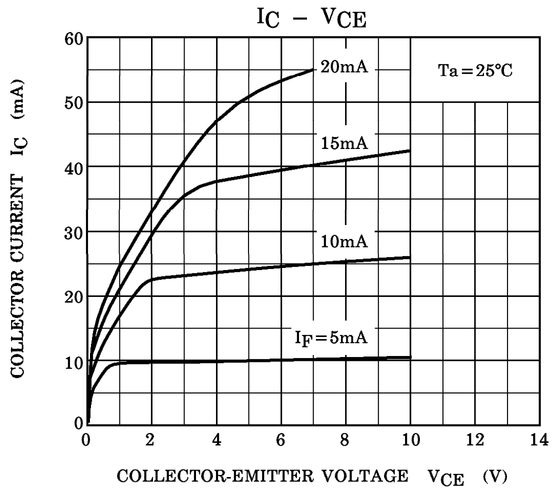

IF – VF
Ta=25°C
FORWARD CURRENT IF (mA)
FORWARD VOLTAGE VF (V)

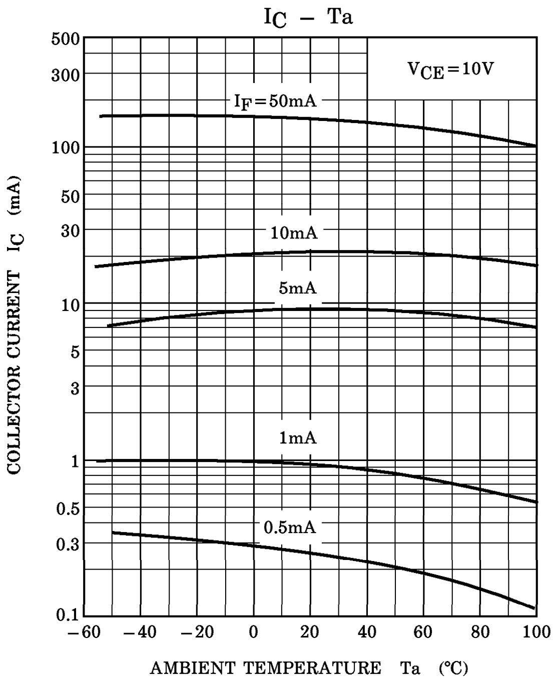

ΔVF/ΔTa – IF
FORWARD VOLTAGE TEMPERATURE COEFFICIENT ΔVF/ΔTa (mV/°C)
FORWARD CURRENT IF (mA)

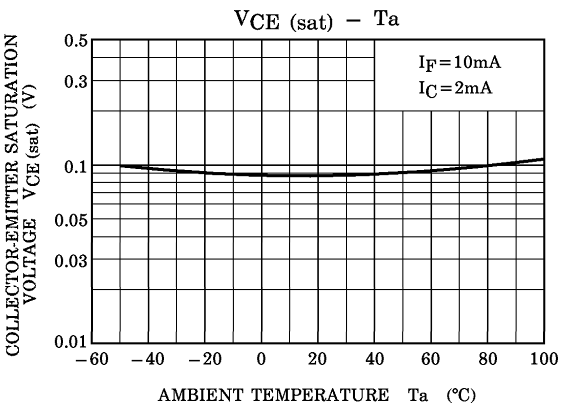

IFP – VFP
PULSE FORWARD CURRENT IFP (mA)
PULSE WIDTH≦10μs
REPETITIVE FREQUENCY
=100Hz
Ta=25°C
PULSE FORWARD VOLTAGE VFP (V)

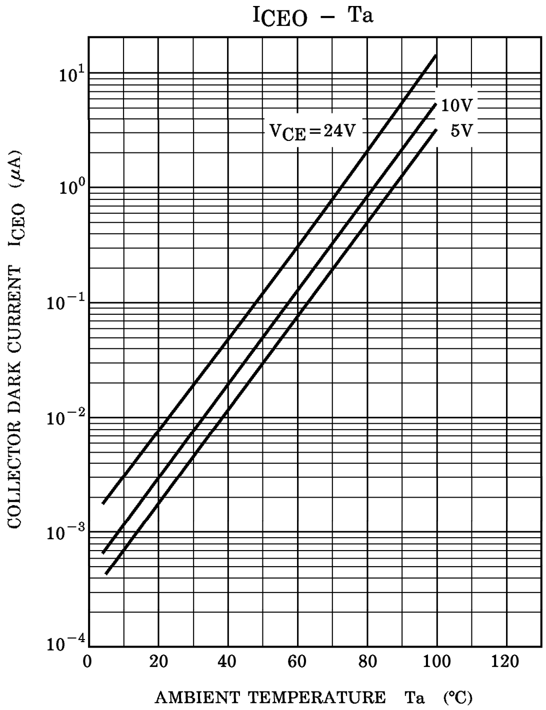

IC – IF
Ta = 25°C
VCE = 10V
VCE = 0.4V
SAMPLE A
SAMPLE B
COLLECTOR CURRENT IC (mA)
FORWARD CURRENT IF (mA)
100
50
30
10
5
3
1
0.5
0.2
1
3
10
30
100

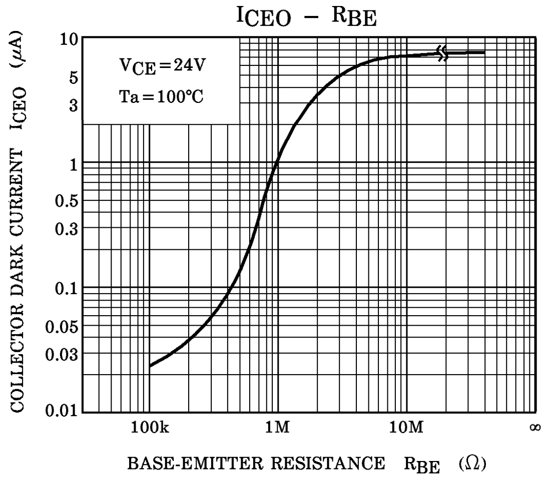

IC / IF – IF
Ta = 25°C
VCE = 10V
VCE = 0.4V
SAMPLE A
SAMPLE B
CURRENT TRANSFER RATIO IC / IF (%)
FORWARD CURRENT IF (mA)
400
300
200
100
0
1
3
10
30
100
300

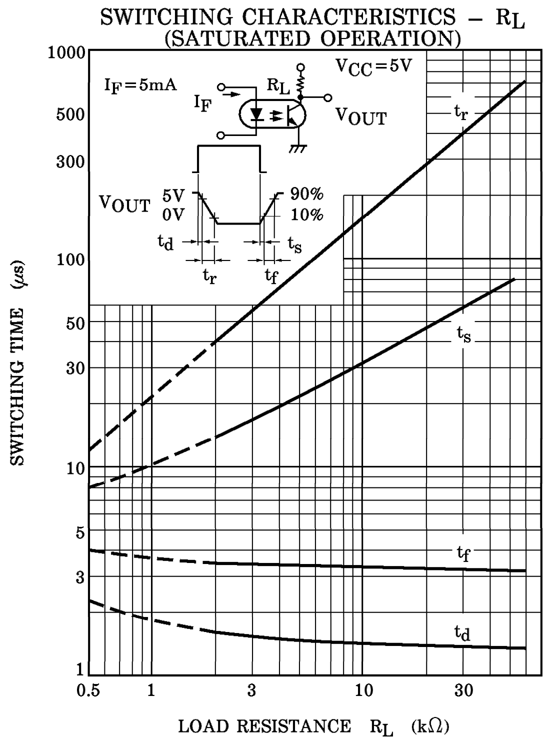

IC – VCE
Ta = 25°C
20mA
15mA
10mA
IF = 5mA
COLLECTOR CURRENT IC (mA)
COLLECTOR-EMITTER VOLTAGE VCE (V)
60
50
40
30
20
10
0
0
2
4
6
8
10
12
14

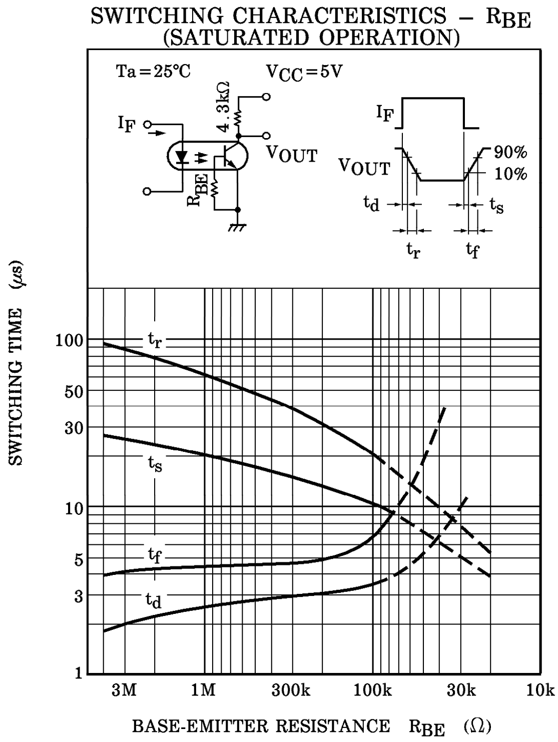

IC – Ta
VCE = 10V
IF = 50mA
10mA
5mA
1mA
0.5mA
COLLECTOR CURRENT IC (mA)
AMBIENT TEMPERATURE Ta (°C)
500
300
100
50
30
10
5
3
1
0.5
0.3
0.1
−60
−40
−20
0
20
40
60
80
100


VCE (sat) – Ta
IF = 10mA
IC = 2mA
COLLECTOR-EMITTER SATURATION VOLTAGE VCE (sat) (V)
AMBIENT TEMPERATURE Ta (°C)
0.5
0.3
0.1
0.05
0.03
0.01
−60
−40
−20
0
20
40
60
80
100


ICEO – Ta
VCE = 24V
10V
5V
COLLECTOR DARK CURRENT ICEO (μA)
AMBIENT TEMPERATURE Ta (°C)


ICEO – RBE
VCE = 24V
Ta = 100°C
COLLECTOR DARK CURRENT ICEO (μA)
BASE-EMITTER RESISTANCE RBE (Ω)


SWITCHING CHARACTERISTICS – RL
(SATURATED OPERATION)
IF = 5mA
VCC = 5V
VOUT
SWITCHING TIME (μs)
LOAD RESISTANCE RL (kΩ)


SWITCHING CHARACTERISTICS – RBE
(SATURATED OPERATION)
Ta = 25°C
VCC = 5V
4.3kΩ
VOUT
SWITCHING TIME (μs)
BASE-EMITTER RESISTANCE RBE (Ω)